TR-91-6

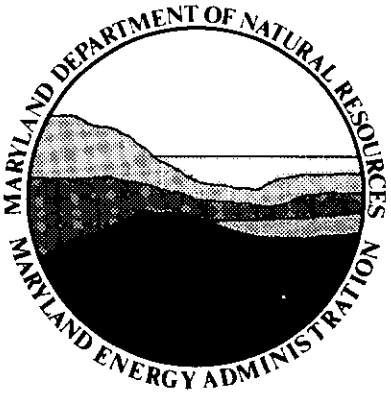
PPSE-8-18

TR-91-6

CHARACTERIZATION OF THE CURRENT BIOLOGICAL COMMUNITIES WITHIN THE NANTICOKE RIVER IN THE VICINITY OF THE VIENNA SES

JULY 1991

POWER PLANT AND ENVIRONMENTAL REVIEW



As Secretary of the Maryland Department of Natural Resources, I am convinced that public support of DNR's mission is essential if we are to restore the State's once bountiful natural resources, especially the Chesapeake Bay, to the level which earned the title "America in Miniature." The information in this publication is designed to increase your understanding of our program and of Maryland's natural resources.

Torrey C. Brown, M.D.

CHARACTERIZATION OF THE CURRENT BIOLOGICAL COMMUNITIES WITHIN THE NANTICOKE RIVER IN THE VICINITY OF THE VIENNA SES

Prepared for

Power Plant and Environmental Review Division
Maryland Department of Natural Resources
Tidewater Administration
Tawes State Office Building
Annapolis, Maryland 21401

Prepared by

C. Foster Stroup
Allison Brindley
Paul F. Kazyak

Versar, Inc.
9200 Rumsey Road
Columbia, Maryland 21045

July 1991

FOREWORD

This document *Characterization of the Current Biological Communities within the Nanticoke River in Vicinity of the Vienna SES* was prepared by Versar, Inc., ESM Operations under the direction of Dr. Peter Dunbar, Project Manager, Maryland Department of Natural Resources, Power Plant and Environmental Review Division (PPER). The PPER contract number for this work is PR86-043-01(90).

This final report presents the results of fish, ichthyoplankton, zooplankton, and benthic surveys conducted between July 1988 and October 1989 in the middle portion of the Nanticoke River, Maryland.

ABSTRACT

Pursuant to a utility's intent to file for permission to build a generating station along the Nanticoke River, Maryland, a field program was conducted to update characterizations of major aquatic biota of the river in proximity to the existing power plant and a potential intake/discharge location. This characterization sampled five stations on the Nanticoke River, spanning 14 miles from Chapter Point to Riverton, between July 1988 and October 1989. During the study period, the juvenile and adult fish community was dominated by white perch, Atlantic menhaden, bay anchovy, hogchoker, and spot. Spring ichthyoplankton was composed of white perch, striped bass, yellow perch, and alosids, while summer ichthyoplankton was dominated by naked gobies and bay anchovy. *Acartia tonsa, Eurytemora affinis* and *Bosmina longirostris* dominated zooplankton samples. The phytoplankton community was composed primarily of diatoms, green algae, and monads. Polychaetes and crustaceans were the dominant macrobenthic taxa, with molluscs contributing to total abundance primarily during spring recruitment. During the dry conditions of 1988, aquatic communities were dominated by estuarine species, while the lower saline environment of 1989 resulted in the presence of more freshwater species. Although the abundance of striped bass ichthyoplankton was substantially less in the spring of 1989 than in either 1978 or 1979 (the only other time comprehensive ichthyoplankton sampling was conducted in the Nanticoke), the region of the Nanticoke River encompassing the existing and potential intake and discharge remains an important spawning and nursery ground for striped bass and other anadromous species.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

Appendices

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES CONTINUED

LIST OF FIGURES CONTINUED

LIST OF FIGURES CONTINUED

LIST OF FIGURES CONTINUED

CHAPTER 1

INTRODUCTION

The Nanticoke River is a major tributary of the Chesapeake Bay and, because of the watershed's relatively low population density and lack of industrial development, retains many of the physical and biological features once characteristic of the waterways throughout the Bay region. The river's production of commercially important invertebrates such as soft-shell clams, oysters, and blue crabs, coupled with its role as a spawning and nursery ground for anadromous fishes, highlight the Nanticoke's value as a natural resource. Limited development in the Nanticoke watershed and the presence of extensive wetlands and farmlands are reflected in the great diversity of wildlife such as ospreys, muskrats, and the federally endangered bald eagle and Delmarva fox squirrel.

Despite the fact that the Nanticoke is largely unaffected by major industrial development or sewage inputs, evidence suggests that some species, such as striped bass and American shad, are declining in the river as they have generally throughout the Bay. The region of the river near Vienna is a striped bass spawning ground. Historically, the Nanticoke contributed roughly 12% of the striped bass production in Maryland waters (Portner and Kohlenstein 1979). However, since the ban on striped bass harvesting was initiated in 1985, the Nanticoke has been the only area surveyed by Maryland Department of Natural Resources to exhibit consistently poor striped bass recruitment. Despite such patterns, other indicators, such as high biological diversity and the absence of anoxia, suggest that the Nanticoke system has good water quality.

Pursuant to Delmarva Power and Light's (DP&L) intent to file for permission to build a 600-megawatt coal-fired generating station along the Nanticoke River in Dorchester County, Maryland, a field program was initiated to update characterizations of aquatic biota in proximity to the existing Vienna plant and the location of a potential intake/discharge for the new plant. Although a variety of biological studies have been conducted in the Nanticoke River (many as a result of the Vienna SES 316 Demonstration and previously proposed expansion efforts), these programs were not comprehensive and a decade has passed since most were performed (Mihursky et al. 1974; Becker 1979; Otto et al. 1980; Portner and Kohlenstein 1979). Recent aquatic work on the Nanticoke has centered around the viability and general distribution and abundance of early life stages of striped bass (Hall et al. 1985; MDNR 1984) because of concern about the status of Chesapeake Bay stocks of striped bass. Few databases exist which would permit a preliminary evaluation of the current

benthic, zooplankton, and phytoplankton communities in the mid-region of the Nanticoke River.

The objectives of this program are to:

- Characterize the fish, ichthyoplankton, zooplankton, phytoplankton, and benthic communities in the vicinity of the existing Vienna SES and a potential intake location (Lewis Landing) to gain critical information for future impact assessments
- Compare results of this characterization with those of previous studies to document any change in the area since the late 1970's
- Determine whether the existing and potential intake sites harbor critical habitat or higher abundances of biota than upstream/downstream areas in the Nanticoke River.

CHAPTER 2

PROJECT DESCRIPTION

A. SAMPLING STATIONS

Five stations were sampled on the Nanticoke River, spanning 14 miles from Riverton to Chapter Point (Fig. 2-1). The five stations were: Chapter Point (River Mile (RM) 9.5), Lewis Landing (RM 13), Muir Creek (RM 16.5), Vienna (RM 20), and Riverton (RM 23.5). These stations encompass three salinity zones (mesohaline, oligohaline and freshwater), and the 3.5 miles between locations is approximately equal to the distance of one tidal excursion.

B. FIELD AND LABORATORY METHODS

Water Quality

A Hydrolab Surveyor II was used to measure physicochemical variables during each sampling event. These variables included: dissolved oxygen (ppm), pH, temperature (°C), conductivity (mmhos/cm), and salinity (ppt). At the initiation of the sampling program in July 1988, physicochemical profiles at two to three meter intervals were performed at each station. Since no vertical stratification was observed, subsequent vertical profiles were reduced to surface, mid, and bottom water measurements at each station.

Ichthyoplankton

Biweekly sampling was conducted in July and August 1988 and April through August 1989, except in July of 1989, when there was only one sampling event. Samples were collected in the channel by towing a pair of 0.5 m diameter plankton nets (bongo, 505 μm mesh). Two tows were taken at each station on each sampling date. Stepped oblique tows were conducted against the current for either 2.5 or 5 minutes at a boat speed of about 1.0 m/s, such that approximately 150 cubic meters of water was filtered through the nets. The entire water column was sampled by deploying the gear first just above the bottom and raising the net in timed progressive steps. Five minute tows were normally conducted but reduced to 2.5 minutes when

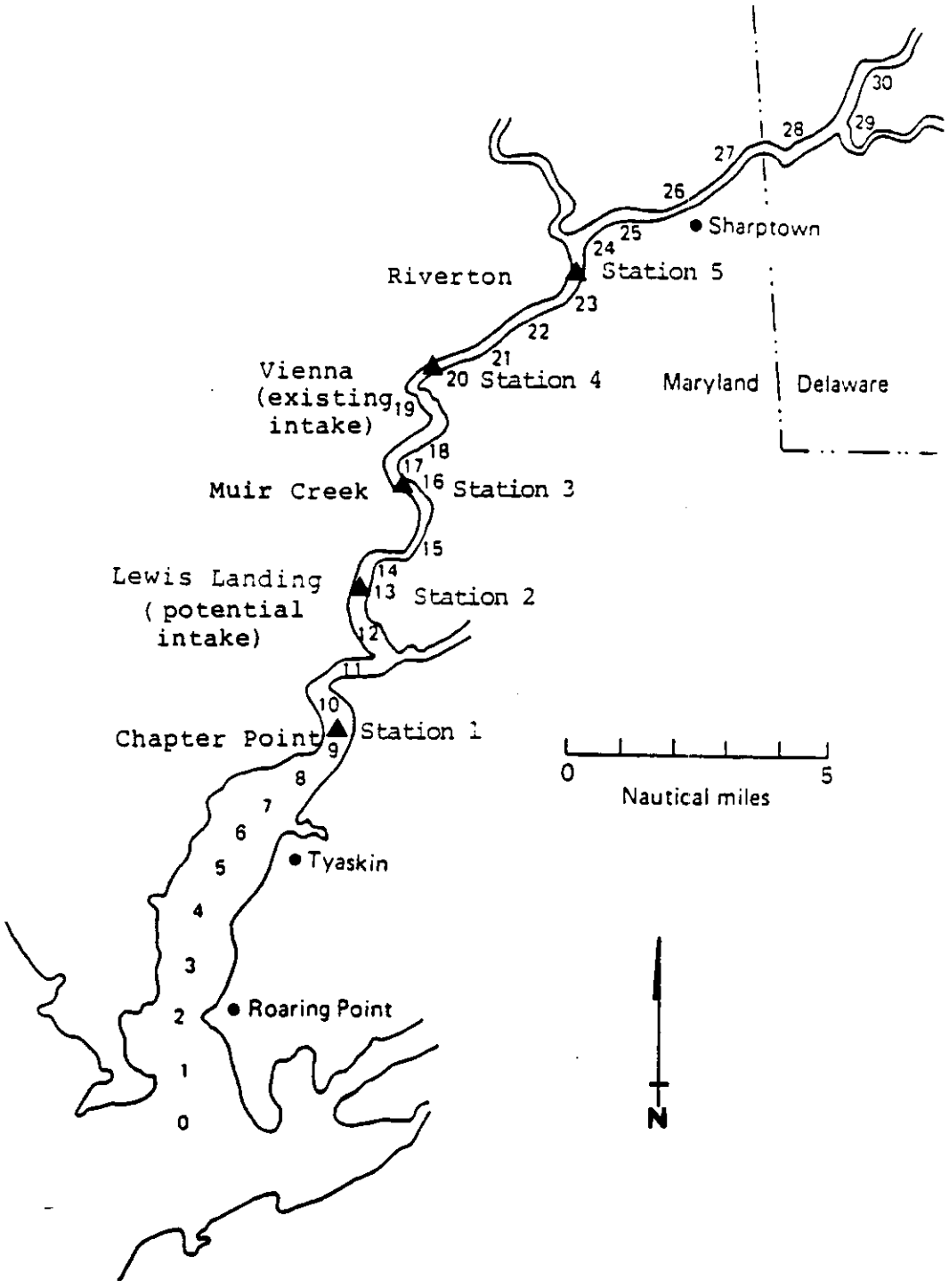


Figure 2-1. Locations of stations for aquatic characterization of the existing and potential intake sites at the Vienna SES

clogging with detritus was evident. The actual volume of water filtered was estimated using a General Oceanics flowmeter mounted in the mouth of one side of the bongo net. The contents of the two nets were combined and preserved in the field with 10% buffered formalin, stained with rose bengal. In the laboratory, one sample from each station and date was processed. When high densities of detritus and/or larvae precluded processing whole samples, samples were split in eighths using a Flosum splitter and half the sample was sorted for ichthyoplankton. Ichthyoplankton were identified to lowest possible taxonomic category and enumerated. *Morone* spp. larvae of 8 mm and longer were identified by the clearing and staining techniques and criteria described by Fritzsche and Johnson (1980) and Olney et al. (1983). Replicate samples have been archived in case additional information is required.

Zooplankton

Monthly sampling was conducted in July, August, and October 1988 and March through August, and October 1989 at all stations. Mesozooplankton samples were obtained by towing a paired 20 cm bongo net (202 μm mesh) in the channel in a stepped oblique fashion, similar to the ichthyoplankton sampling. Two complete tows were made as replicates. The duration of the tow was 2.5 minutes during periods of high ctenophore and jellyfish density and 5 minutes otherwise. The actual volume of water filtered was estimated using a General Oceanics flowmeter mounted in the mouth of one side of the bongo net. The sample from one side of the net was preserved with 10% buffered formalin, stained with rose bengal.

In the laboratory, one sample from each station and date was processed. The replicate has been archived, should additional information be required. Each sample processed was placed first in graduated Imhoff cones, and the settled volume (ml/m^3) was calculated. The entire sample was visually scanned for larger macrozooplankton such as amphipods, isopods, and mysid shrimp. Data on mesozooplankton density were obtained by concentrating or diluting the sample to a volume that facilitated counting subsamples taken with a Hensen-Stempel pipette. Subsample counts were accomplished using a hierarchial counting technique to obtain reliable density estimates for less abundant, as well as, dominant species. First, at least 60 individuals of the most dominant species (e.g., *Acartia tonsa*) in a 1-2 ml subsample were counted. Similar counts then were made for 5 and 10 ml subsamples, from which all species that had totals less than 60 in the previous subsample were counted. Counts for each species were expressed as numbers per cubic meter of water sampled (#/m^3).

Phytoplankton

Monthly phytoplankton samples for species composition were collected only at the Vienna and Lewis Landing stations. Collections were taken during July, August, and October 1988 and during 1989 from March through August, and October. A surface-to-bottom integrated water sample was collected and preserved with Lugol's solution. Chlorophyll-a samples were collected at all five stations from an integrated water sample, filtered through glass microfiber filters and frozen on dry ice.

In the laboratory, phytoplankton samples were processed using a sedimentation technique (Utermohl 1958) and examined with a Leitz inverted microscope equipped with phase contrast condenser and objectives. A minimum settling time of 4 hr/cm of chamber height was required. Microscopic examination proceeded by a random field technique, with a minimum of 10 random fields counted per sample. Cell densities were calculated by relating the area of a random field (magnification dependent) to the total chamber area and adjusting for aliquot size (APHA 1985). A minimum of 100 cells were counted to achieve a 95% confidence interval with a precision of +/- 20% of the mean. In samples with very high detrital or silt components, a maximum of 40 random fields were counted on the largest aliquot permissible.

Frozen filters were placed in test tubes with acetone, ground, and filtered through glass fiber filters. The filtered extracts were examined with a fluorometer, treated with dilute hydrochloric acid to remove phaeophytins and re-examined to determine chlorophyll-a concentrations.

Benthos

Three locations were sampled at each of the five stations in July, and October 1988 and March, May, July, and October 1989. The three locations were on the east and west sides of the river and in the channel. Samples were collected with a ponar grab, which samples a 0.025-m^2 area to a depth of 7 cm and sieved in the field through a 0.5 mm mesh screen. Organisms and detritus retained on the screen were preserved in 10% buffered formalin, stained with rose bengal. Two replicate samples were taken; one was processed, and the other has been archived for possible future use. In addition, a sediment sample was collected from each location in July 1988 and frozen on dry ice.

In the laboratory, organisms were sorted from detritus under low magnification and identified to lowest possible taxonomic category. Oligochaetes and chironomid larvae were not further identified. Counts were converted to num-

bers per square meter based upon the area sampled. Sediment samples were analyzed for silt-clay composition, interstitial salinity, moisture content, and carbon content. Sediment carbon content was measured using a Perkin-Elmer Model 240C Elemental Analyzer.

Fish

The fish sampling program employed a combination of trawling, seining, and gill netting. Collections were made in July and October 1988 and March, May, July, and October 1989. A 9.1 m otter trawl with 9.1 m head rope, 13 mm stretch mesh, and 6 mm codend liner was towed into the current in the channel for 5 minutes at each of the stations. At each station, a 46 m monofilament gill net with 2.4 m panels and 3.8 to 10.2 cm stretch mesh was anchored just outside the navigational channel and oriented parallel to the shore. The gill nets were set in the late afternoon and allowed to fish until the next morning. A 30.5 m beach seine with a 1.2 m panel and 9.5 mm stretch mesh was used to sample the shallow zones on the east and west banks of each of the five stations. The seine was extended to its full length perpendicular to the shoreline. The offshore end was pulled against the direction of tidal movement in a sweeping 90 degree arc to shore. Fish and crabs collected from each gear type were identified, counted, and released. For each species, a subsample of 25 individuals was measured for length (total length for fish and point-to-point width for blue crabs).